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Polymer Diffusion in Carbon Nanofiller / Polymer Nanocomposites MINFANG MU, Department of Materials Science and Engineering, University of Pennsylvania, NIGEL CLARKE, Department of Chemistry, Durham University, RUSSELL COMPOSTO, KAREN WINEY, Department of Materials Science and Engineering, University of Pennsylvania — Polymer tracer diffusion through carbon nanofiller / polymer nanocomposites is measured using elastic recoil detection methods. Tracer diffusion through a single wall carbon nanotube nanocomposite is strongly suppressed at low concentrations ($\leq$ 0.4-0.8 vol%) and then increases at higher concentrations. In contrast, the typical Maxwell model predicts only a weak monotonic decrease. We propose a model for the carbon nanotube composite system wherein the SWCNTs function as cylindrical traps. Simulations of this model found that at low concentrations, the isolated traps retard polymer diffusion and at higher concentrations the percolated traps allow polymer diffusion to recover by providing continuous pathways. A comparison of our experimental and simulation results finds that (1) the strength of the trap increases with the molecular weight of the diffusing polymers and (2) the trap diameter increases with the molecular weight of the matrix polymer. Similarly, tracer diffusion through C60 / polymer nanocomposites exhibits a significant decrease at low concentrations and then slowly increases at concentrations larger than 0.7 vol%.

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